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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/575,785

04/14/2006

Kensuke Takahashi

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01/28/2009

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EXAMINER

SMOOT, STEPHEN W

ART UNIT

PAPER NUMBER

2813

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/575,785	<b>Applicant(s)</b> TAKAHASHI ET AL.	
	<b>Examiner</b> Stephen W. Smoot	<b>Art Unit</b> 2813	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 October 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2-7 and 10-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 21-26 and 33-39 is/are allowed.
- 6) ☒ Claim(s) 2, 5, 10-20 and 27-32 is/are rejected.
- 7) ☒ Claim(s) 3, 4, 6 and 7 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 April 2006 and 28 October 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

This Office action is in response to applicant's amendment filed on 28 October 2008.

### ***Drawings***

1. A replacement drawing sheet corresponding to Figs. 1-2 was received on 28 October 2008. These drawings are acceptable.

### ***Specification***

2. The substitute specification filed on 28 October 2008 has not been entered because it does not conform to 37 CFR 1.125(b), namely, it is not accompanied with a statement indicating that it includes no new matter.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 10, 27-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10 recites the limitation "said metal M" in lines 3-4;

Claim 27 recites the limitation "said metal M" in lines 2, 4-6;

Claim 28 recites the limitation "said metal M" in line 3; and

Claim 30 recites the limitation "said metal M" in line 2.

There is insufficient antecedent basis for this limitation in claims 10, 27-28, 30.

Claim 29 is rejected under 35 U.S.C. 112, second paragraph, because it depends on claim 27.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 2, 5, 10-14, 17, 20, 32 are rejected under 35 U.S.C. 102(a) as being anticipated by K. Takahashi et al. (the article appearing in IEDM Technical Digest, IEEE, December 2004, pp. 91-94 – from applicant's IDS filed on 4-14-06).

Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15. It is noted that the application papers filed on 14 April 2006 include a declaration indicating that the originally filed specification and claims are an exact translation of PCT/JP05/11331 filed on 21 June 2005. However, there is no such declaration for the Japanese priority document, Japanese application number 2004-184758 filed on 23 June 2004.

Referring to the abstract, K. Takahashi et al. disclose a CMOS structure that includes an HfSiON gate insulator, a PMOS transistor having a fully silicided  $\text{Ni}_3\text{Si}$  gate electrode (i.e.  $x=0.75$ ), and an NMOS transistor having a fully silicided  $\text{NiSi}_2$  gate electrode (i.e.  $x=0.33$ ).

These are all of the limitations as set forth in claims 2, 5, 10-14, 17, 20, 32 of the applicant's invention.

7. Claims 12-20, 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Kittl (US 2006/028156 A1).

Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with

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37 CFR 1.55. See MPEP § 201.15. It is noted that the application papers filed on 14 April 2006 include a declaration indicating that the originally filed specification and claims are an exact translation of PCT/JP05/11331 filed on 21 June 2005. However, there is no such declaration for the Japanese priority document, Japanese application number 2004-184758 filed on 23 June 2004.

Referring to the provisional application filed on 16 May 2005 (see the “Materials Issues” article, page 6, lines 20-25 and the “Scalability” article, Figs. 11-12 and the abstract), Kittl discloses PMOS transistors with fully silicided gate structures that include a high k gate dielectric material formed on a silicon wafer that can be hafnium silicon oxynitride or a hafnium silicon oxynitride/silicon dioxide stack (also see the “Materials Issues” article, page 2, lines 13-14) and a  $\text{Ni}_3\text{Si}$  gate electrode formed on the high k gate dielectric material.

These are all of the structural limitations as set forth in claims 12-20 of the applicant’s invention.

Regarding claim 31, the nickel silicide gate electrodes are formed by blanket depositing nickel over a polysilicon/gate dielectric stack, which implies that the polysilicon is deposited and patterned, followed by thermal treatments and removal of unreacted metal by selective etching to form the fully silicided gate electrodes (also see the “Scalability” article, Fig. 5 and the results and discussion section). Also, as indicated in the results and discussion section, the  $\text{Ni}_3\text{Si}$  phase is stable for nickel to polysilicon layer thickness ratios that are greater than 1.7.

***Response to Arguments***

8. Applicant's arguments, see pages 13-15, filed 28 October 2008, with respect to the prior art rejections based on Matsuo et al. (US 2003/0143825 A1) have been fully considered and are persuasive. Therefore, the rejections have been withdrawn.

However, upon further consideration with regards to claims 2, 5, 10-14, 17, 20, 32, a new ground of rejection is made in view of K. Takahashi et al.

9. Applicant's arguments, see pages 15-18, filed 28 October 2008, with respect to the prior art rejections of claims 12-20, 31 based on Kittl (US 2006/0258156 A1) have been fully considered but they are not persuasive.

As indicated in the above rejection, the provisional application filed by Kittl on 16 May 2005 provides adequate support for the rejection of claims 12-20, 31.

10. Applicant's arguments, see pages 15-18, filed 28 October 2008, with respect to prior art rejections of independent claims 21-23, 32-39 based on Kittl (US 2006/0258156 A1) have been fully considered and are persuasive. Particularly, with regards to claim 32, although Kittl discloses NMOS transistors having a NiSi gate (i.e.  $x=0.5$ ) and PMOS transistors having a Ni<sub>3</sub>Si gate (i.e.  $x=0.75$ ), they do not expressly teach or suggest an NMOS transistor having a nickel silicide gate where  $x$  is less than or equal to 0.5 in combination with a PMOS transistor having a nickel silicide gate where  $x$  is greater than 0.5.

***Allowable Subject Matter***

11. Claims 3-4, 6-7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims.

12. Claims 21-26, 33-39 are allowed.

***Conclusion***

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on Monday to Friday from 8:00am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Stephen W Smoot/  
Primary Examiner  
Art Unit 2813

SWS